MIDG Display Utility

USER MANUAL

V2.0.17

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Innovative System Integration and Control

MICROBOTICS, INC.

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NOTE: This instruction assumes that the MIDG Series INS/GPS software has previously been installed on the PC or laptop. This software needs to be installed prior to using this instruction.

1 Introduction. The MIDG Display Utility is a Windows® executable program included on the MIDG Series INS/GPS software and utilities CD-ROM (Figure 1). This program is designed as a graphical user interface and enables the user to change the operational settings of the MIDG Series INS/GPS. The MIDG Display Utility has several functions such as; data recording, artificial horizon correction, sensor plotting and magnetometer calibration.

2 MIDG Series INS/GPS Hardware Interface. The MIDG Series INS/GPS provides a RS-422 signal output. Refer to the MIDG Series INS/GPS user manual for instruction on how to properly interface the MIDG Series INS/GPS.
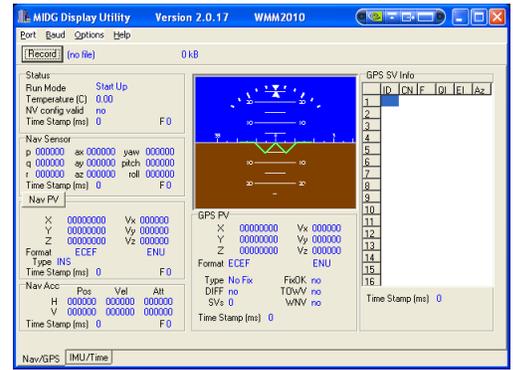
Figure 1. MIDG Display Utility

3 The MIDG Display Utility. The MIDG Display Utility has two main screens. These screens are divided into several logical sections and each logical section corresponds to a specific message outputted by the MIDG Series INS/GPS. Refer to the latest MIDG Series INS/GPS Message Specification for more information on the specifics for each message available.

The MIDG Display Utility is divided into two (2) tabs consisting of the NAV/GPS screen and IMU/Time screen. Each screen has been divided into logical sections for each of the messages which may be provided by the MIDG Series INS/GPS.

Note: All of the messages will have a time stamp as to the last interval of update. The time stamp will display the current time stamp of the MIDG Series INS/GPS. The time will be unsigned time from the power up of the unit until the MIDG Series INS/GPS has received a valid Time Of Week Value (TOWV) from the GPS receiver. The time stamp will not be listed in the description of the message sections as the definition is the same.

4. NAV/GPS Screen. The NAV/GPS screen displays the GPS and navigational data from the MIDG Series INS/GPS. This data is comprised of several parts. Each part will be detailed starting from the top-left corner of the screen (Figure 2).

    4.1   **Menu Bar.** The Menu Bar contains several options which enable the user to interface and configure the MIDG Series INS/GPS.

        A.   **Port -** This drop-down menu is used to select the COM port to which the MIDG Series INS/GPS is connected.

        B.   **Baud -** This drop-down menu is used to set the baud rate for the MIDG Display Utility only.
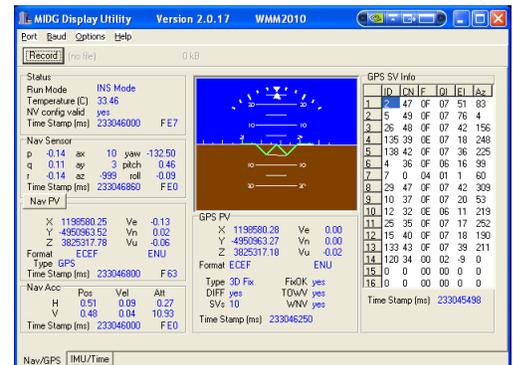
NOTE: The MIDG Series INS/GPS has to be configured to the same baud rate as the display utility. Refer to Section 6.3 for information on how to change the MIDG Series INS/GPS's baud rate.

Figure 2. Nav/GPS screen

        C.   **Options -** This drop-down menu opens the *MIDG Config and Plot* dialog boxes.

        D.   **Help -** This drop-down menu opens the information box about the MIDG Display utility and the contact information for Microbotics, Inc.

4.2 **Record -** The record button allows users to record data from the MIDG Series INS/GPS for later analysis. The blue words, "no file" and the "0 kB" indicates that no file has been selected and no data is being recorded. Please refer to Section 8 of this manual for more information on this feature.

4.3 **Status -** The Status section displays the current status of the MIDG Series INS/GPS including; Run Mode, Temperature, Non-Volatile Fram Configuration (NV Config) status, and the current Time Stamp (Figure 3). The message ID for the Status message is "1." Each piece of information is detailed below.
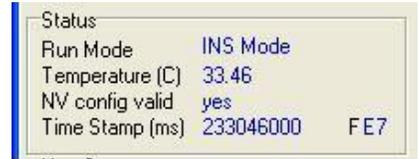
Figure 3. Status Section

    A. **Run mode -** The run mode display the current state of the unit. Please refer to the application note titled, "AN001 Operational Modes" included in the documents folder for complete details on the operational modes of the MIDG Series INS/GPS.

    B. **Temperature -** This displays the current internal temperature, listed in degrees Celsius, of the unit.

    C. **NV config valid -** This displays the current status of the unit's non-volatile ram (NV Config).

4.4 **Nav Sensor -** The Nav Sensor section displays the individual data outputs, as determined by the Kalman filter, for each of the rate (p, q, r) and accelerometer (ax, ay, az) sensors as well as the yaw, pitch, and roll sensed by the MIDG Series INS/GPS (Figure 4). The message ID for the Nav Sensor message is "10." Each piece of information is detailed below.
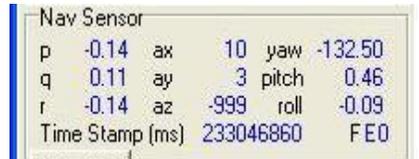
Figure 4. Nav Sensor Section

    A. **p, q, r -** Theses sensors correspond to the *x, y, and z* axis rate sensors.

    B. **ax, ay, az -** These sensors correspond to the displays the *ax, ay, and az* accelerometer sensors (-1000 on the *z* axis is equivalent to one (1) G of gravity).

    C. **Yaw, Pitch, Roll -** This output is the *yaw, pitch, and roll* in degrees as sensed and calculated by the unit.

4.5 **Nav PV -** The NAV PV section displays the navigation position and velocity as determined by the MIDG Series INS/GPS. This is the Kalman filtered output which is derived from a combination of sensor readings and GPS information (Figure 5). The message ID for the Nav PV message is "12." Each piece of information is detailed below.
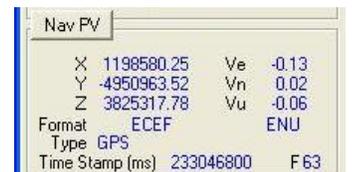

Figure 5. Nav PV Section

    A. **X,Y, Z -** This displays the location of the unit in the specified format.

    B. **Velocity -** This displays the velocities sensed by the unit in the specified velocity format.

    C. **Type -** This display the *Run Mode* of the unit.

NOTE: Section 4.2.3 is accessed by pressing the "Nav PV" button on the MIDG Display Utility. This message is disabled by default and must be enable via the MIDG Configuration "Config" dialog box.

4.6 **Nav Hdg -** The NAV Hdg section displays several pieces of heading information as determined by the Kalman filter and the magnetic declination and calibration of the MIDG Series INS/GPS. (Figure 6). The message ID for the Nav Hdg message is "13." Each piece of information is detailed below.

Figure 6. Nav Hdg Section

    A. **Mag Dec -** The "Mag Dec" is the magnetic declination. The declination is positive when the magnetic north is east of true north and negative when magnetic north is west of true north.

    B. **Mag Dip -** The "Mag Dip" is the magnetic inclination. A Positive "dip" value indicate the field is pointing into the Earth and negative values indicate the field is pointing out of the Earth.

C.   **M Hdg -** The "M Hdg" is the magnetic heading is the heading detected and calculated by the internal magnetometer and Kalman filter. A positive reading indicates a heading with an Eastern influence and a negative reading indicates a heading with a western influence.

D.   **COG -** The "COG" is the course over ground as calculated by the Kalman filter.

E.   **SOG -** The "SOG" is the speed over ground and determined by the Kalman filter.

F.   **Vup -** The "Vup" is the calculated vertical velocity as determined by the Kalman filter.

4.7   **NAV ACC -** This message indicates the accuracies of the error estimates in accordance to the Kalman filter covariance's (Figure 7).

Figure 7. Nav ACC Section

A.   **H -** Indicates heading in position (Pos), velocity (Vel) and attitude (Att).

B.   **V -** Indicates velocity in position (Pos), velocity (Vel) and attitude (Alt).

4.8   **Artificial Horizon -** The artificial horizon provides a visual display of the *Yaw, Pitch,* and *Roll* as sensed and calculated by the unit (Figure 8).

A.   **Yaw -** Displayed in increments of five (5) degrees with notations every ten (10) degrees and numerical notations every thirty (30) degrees.

B.   **Pitch -** Displayed in increments of five (5) degrees with numerical notations every ten (10) degrees.

C.   **Roll -** Displayed in increments of five (5) degrees with notations every fifteen (15) degrees.
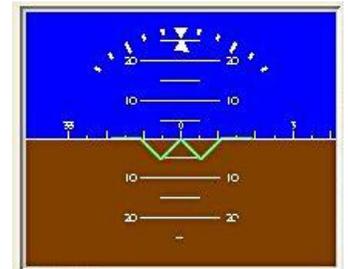
Figure 8. Artificial Horizon Section

4.9   **GPS PV -** The GPS_PV is the position and velocity as reported from the GPS receiver (Figure 9). The message ID for the GPS_PV message is "20." Each piece of information is detailed below.

A.   **X, Y, Z -** This represents the three dimensional (3D) coordinate axis position of the unit on the earth and is will be displayed as; *ECEF* (Earth Centered, Earth Fixed) or *LLA* (Latitude, Longitude, Altitude).

B.   **Ve, Vn, Vu -** This represents the three dimensional (3D) position velocities of the MIDG Series INS/GPS on the earth and is will be displayed as; *ECEF* (Earth Centered, Earth Fixed) or *ENU* (East/ North Up).

C.   **Type -** This field defines the type of GPS fix, the Kalman filter requires a minimum of a 3D Fix. There are only two (2) "fixes" which will be displayed in this field.

Figure 9. GPS PV Section

      i.   **No Fix -** GPS information is not available or is invalid for position fix.
      ii.   **3D Fix -** GPS information is available and is valid for a position fix.

D.   **Diff -** This indicates whether the GPS receiver is using differential satellites.

E.   **SVs -** This is the number of satellites which are currently tracked by the GPS receiver.

F.   **FixOK -** Indicates the GPS receiver has a valid position fix.

G.   **TOWV -** This is a seconds-into-week number value outputted by the GPS receiver.

H.   **WNV -** The week number value outputted by the GPS receiver.

4.10   **GPS_SVI -** The GPS_SVI (Figure 10) displays the currently tracked GPS satellites (SVs). The rows are numbered 1-16 for the number of possible SVs which can be tracked by the GPS receiver. Each column represents data pertaining to each of the tracked satellites. The message ID for the GPS_SVI message is "21." Each piece of information is detailed below.

A.   **ID -** This is the satellite identification number broadcasted by the satellite.

B.   **CN -** This is the carrier signal to noise ratio (CN/o). Normal readings range from 38 to 55.

C.   **F -** Flags indicated the status of the information being received from the tracked satellites. There are five (5) possible flags which may be set;

       i.   DGPS data available for this satellite.
       ii.   Orbit information available for this satellite.
       iii.   Orbit information is ephemeris.
       iv.   Satellite is unhealthy, will not be used.

D.   **QI -** This is the information regarding the receiver channel. There are six (6) possible values.

Figure 10. GPS SV Info Section

       i.   0:   Channel is idle.
       ii.   1-2:   Channel is searching for GPS Signal.
       iii.   3:   Signal is detected but is unusable.
       iv.   4:   Code is locked.
       v.   5-6:   Code and carrier locked.
       vi.   7:   Code/carrier locked and receiving 50 bps of data.

5   IMU/TIME Screen. The IMU/Time screen is the second main screen of the MIDG Display Utility (Figure 11) and like the NAV/GPS screen, it too has been divided into several logical sections which display various information outputted by the MIDG Series INS/GPS.

NOTE: All of the messages in the IMU/Time Tab are disabled by default. These messages may be enabled via the MIDG Configuration "MIDG Config" dialog box.

5.1   **IMU/Time Logical Sections.** Each logical section of the IMU/Time tab provides IMU and timing information transmitted from the MIDG Series INS/GPS. This section of the manual will detail each of the logical sections for the IMU/Time tab and will specify the corresponding message ID. Please refer to the MIDG Series INS/GPS Message Specification for complete information on all of the available MIDG Series INS/GPS messages.

Figure 11. IMU/Time screen

5.2   **IMU Data -** The IMU_Data section displays the internal IMU sensor outputs prior to any Kalman filtering. This block displays the angular positions of the unit (Figure 12). The message ID for the IMU_DATA message is "2." Each piece of information is detailed below.

A.   **p, q, r -** These outputs correspond to the angular rates of the unit rate sensors *(x, y, and z,* respectively).

B   **ax, ay, az -** These outputs correspond to the angular accelerations of the unit's accelerometers.

C.   **mx, my, mz -** These outputs correspond to the angular magnet reference of the unit's magnetometers.


Figure 12. IMU Data Section

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5.3   **IMU Mag -** The IMU Mag section displays the three axis of the magnetometer. This is the same data displayed in the IMU Data section (Figure 13). The message ID for the IMU_MAG message is "3."
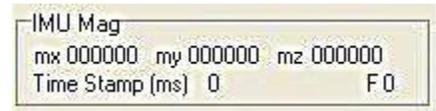
Figure 13. IMU Mag Section

5.4   **GPS_CLK -** This section displays the GPS clock solution (Figure 14). The message ID for the GPS_CLK message is "23." Each piece of information is detailed below.

   A.   **Clock Bias (ns) -** This displays the difference between the GPS clock and Coordinate Universal Time (UTC).
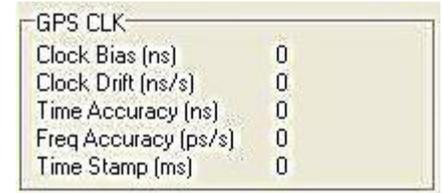
Figure 14. GPS CLK Section

   B.   **Clock Drift (ns/s) -** This is a display of the clock drift of the GPS receiver in comparison to the received UTC.

   C.   **Time Accuracy (ns) -** Time accuracy estimation.

   D.   **Frequency Accuracy (ps/s) -** Frequency accuracy estimation.

5.5   **TIM_UTC -** This section displays the (UTC) when a valid data is available from the GPS receiver (Figure 15). The message ID for the TIM_UTC message is "25." Each piece of information is detailed below.

   A.   **UTC -** This is the UTC time which has been deciphered into a Year-Month-Day and GMT format.
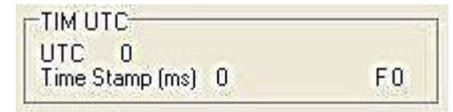
Figure 15. TIM UTC Section

5.6   **TIM ERR -** This message is a legacy message and does not provide any usable data. This message has been disabled in firmware version 2.3.1 and higher.

5.7   **TIM PPS -** This message is a legacy message and does not provide any usable data. This message has been disabled in firmware version 2.3.1 and higher.

5.8   **TIM TM** - The TIM_TM message is available on MIDG Series INS/GPS units with the Time Mark option (MBI#SIS90031C-SR) The unit sends out a standard high pulse and an inverted pulse for a duration of 1 second (Figure 16). The message ID for the TIM_TM message is "28."
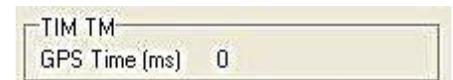
Figure 17. TIM TM Section

   A.   **GPS Time (ms) -** This time is the GPS time from the beginning of the pulse.

Note: The "Time Mark" feature is a hardware configuration feature available only on specifically modified MIDG Series INS/GPS units. This modification is only provided by Microbotics, Inc. and cannot be done in the field. Any attempt to perform this modification will void the warranty.

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6 MIDG Display Utility Configuration Menu. The MIDG Display Utility has a link to open the MIDG Configuration dialog box (MIDG Config). The MIDG Config dialog box allows the user to fine tune the MIDG Series INS/GPS output to their specific application requirements.

6.1 **Accessing the MIDG Config dialog box.** The MIDG Config dialog box (Figure 18) can only accessed through the MIDG Display Utility. The following will instruct the user on how to access this feature.

1. <u>Start an instance of the MIDG Display Utility.</u>

2. <u>Select the "Options" drop down menu.</u>

3. <u>Select "MIDG Config".</u>

Note: Only one (1) configuration profile may be stored in the MIDG Series INS/GPS.

6.2 **General -** The *"General"* tab (Figure 18) has three (3) function buttons. These buttons allow the user to control the configuration profile. Each feature is detailed below.

A. **Save Configuration -** This function allows the user to save any changes made to the configuration profile of the unit. The configuration profile is stored in the NV Ram

B. **Revert to Saved Configuration -** This function allows the user to discard any changes to the Configuration which have been set but not saved.

C. **Erase Configuration -** This function allows the user to load the factory default settings for the unit (Attachment A).

Note: After changing any configuration setting, be sure to press the "SET" button at the bottom of the dialog box to send the change to the MIDG Series INS/GPS unit. If the changes are to be part of the stored configuration profile, be sure to press the "SAVE CONFIGURATION" button in the "General" tab before cycling the power. Any changes not saved will be discarded.
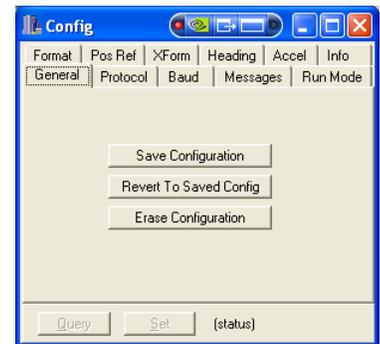
6.3 **Protocol -** The "Protocol" tab (Figure 19)is completely grayed out. Though there are three (3) radio buttons, there are no settings which can be changed here. The "Microbotics Binary" is the only protocol currently supported by Microbotics, Inc.
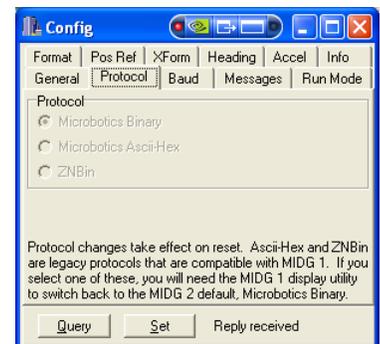
6.4 **Baud -** The "Baud" tab (Figure 20) is used to set the communication transfer rate. This rate can be adjusted as needed for wireless communication or lengthy communication cables. The MIDG Display Utility defaults to 115200 baud.
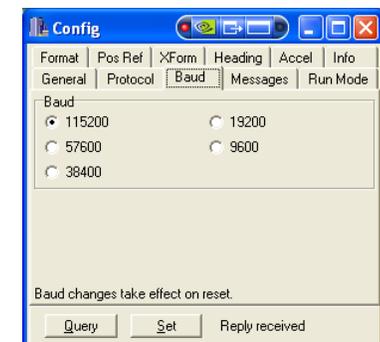
Note: The Baud tab only changes to baud rate of the MIDG Series INS/GPS unit This setting does not change the Baud for the MIDG Display Utility. It is necessary to change the baud rate of the MIDG Display Utility only after the baud rate in the MIDG Series INS/GPS unit has been made, saved, and the power cycled.

6.5 **Messages -** The "Messages" tab (Figure 21) is used to set the message rates for all of the different sections of the NAV/GPS and the IMU/Time screens. This tab allows users to change which messages and message rates are outputted by the unit.

Note: For more information on all messages which may be sent to or received from the MIDG Series INS/GPS unit, please refer to the Message Specification for the version of firmware installed in the unit.

Figure 18. General Tab

Figure 19. Protocol Tab

Figure 20. Baud Tab

Figure 21. Messages Tab

A. **Message Drop-down List -** This drop-down list will display all of the messaged which may be configured. Table 1 shows all of the displayed messages for this tab.

Note: The TIM_ERR, and TIM_PPS messages are disabled. These messages cannot be configured on Fimware version 2.3.1 and higher.

Note: The TIM_TM message is only applicable to MIDG Series INS.GPS units which have the Time Mark modification (MBI# SIS90031C-SR). Enabling this message on a standard MIDG Series INS/GPS unit will produce no output.

Note: MIDG Display Utility version 2.0.17 lists these messages, but will not enable the user to set any update rate for these messages

B. **Divisor Entry Box -** The Divisor entry box allows any selected message to be configures to be outputted at a specific frequency from one to fifty (1-50 Hz). Messages may be disabled from the output stream by entering a zero (0) as a divisor; however, all messages can still be queried through a control platform when they are disabled.

C. **Frequency Display -** The frequency display calculates the divisor automatically and displays the frequency of the message.

Note: Please refer to application note "AN001 – Operating Modes" for more information concerning the different operational modes of the MIDG Series INS/GPS.

Table 1. MIDG II INS Messages Drop-down List			
Default Setting	Message	Divisor	Frequency (Hz)
Enabled	STATUS	50	1.00
Disabled	IMU_DATA	0	0
Disabled	IMU_MAG	0	0
Enabled	NAV_SENSOR	1	50
Enabled	NAV_PV	5	10
Disabled	NAV_HEADING	0	0
Enabled	NAV_ACC	50	1
Enabled	GPS_PV	12	4.17
Enabled	GPS_SVI	50	1
Disabled	GPS_RAW	0	0
Disabled	GPS_CLK	0	0
Disabled	TIM_UTC	0	0
Not Available	TIM_ERR	0	0
Not Available	TIM_PPS	0	0

6.6 **Run Mode -** The "Run Mode" tab (Figure 22) is used to change the operating mode and configuration of the unit.

A. **IMU -** The "IMU" mode converts the unit from an INS into an inertial measurement unit (IMU) and represents the most basic operation. The IMU can only provide calibrated values for angular rate, acceleration, and magnetic field.

Note: Measurements from the GPS receiver are also available; however, none of the position/velocity/attitude estimation algorithms are executed. Position and velocity information can be polled from the GPS receiver at rates up to 4Hz.

B. **Vertical Gyro -** The **"**Vertical Gyro" (VG) mode, basic attitude estimations are added to the IMU data. In VG mode, the data from rate sensors is accumulated to provide an estimate of attitude. Accelerometer data is added to compensate for rate sensor drift and magnetometer data is used to indicate magnetic north.

C. **INS -** The "INS" mode provides estimates of position, velocity, and attitude at up to 50Hz using a state estimation filter. Error-corrected angular rates and accelerations are provided as well. In order to enter INS mode, the MIDG II INS must be configured for INS operation (which is the default) and GPS must be available.

Figure 22. Run Mode Tab

6.7 **Format -** The "Format" tab (Figure 23) is used to configure the output of the unit's position and velocity messages displayed on the NAV/GPS screen.

A. **Position Format -** Position Format allows the user to select the position format to be outputted in the GPS_PV and NAV_PV messages.

i. **ECEF -** "Earth-Centered, Earth-Fixed." A coordinate system where X, Y, and Z coordinates are in relation to the center of the earth (Center of Earth is point 0,0,0).

ii. **ENU -** "East, North, Up" A coordinate system formed from a plane tangent to the Earth's surface fixed to a specific point on the Earth's surface. By convention the east axis is labeled x, the north y and the up z.

Figure 23. Format Tab

iii. **LLA -** "Latitude, Longitude, Altitude" and is a geographic coordinate system which enables every location on the Earth to be specified by a set of numbers.

B. **Velocity Format -** The velocity format adjusts and determines how velocity output is formatted in the GPS_PV and NAV_PV messages.

i. **ECEF -** "Earth-Centered, Earth-Fixed." A coordinate system where X, Y, and Z coordinates are in relation to the center of the earth (Center of Earth is point 0,0,0).

ii. **ENU -** "East, North, Up" A coordinate system formed from a plane tangent to the Earth's surface fixed to a specific point on the Earth's surface. By convention the east axis is labeled x, the north y and the up z.

C. **ENU Relative To First Fix -** This checkbox is grayed out by default. However, if the position format of ENU is selected, the checkbox becomes active. This check box is used to set a *"Home"* location when a GPS lock is achieved. The MIDG II INS then calculates its location from this point of first GPS fix.
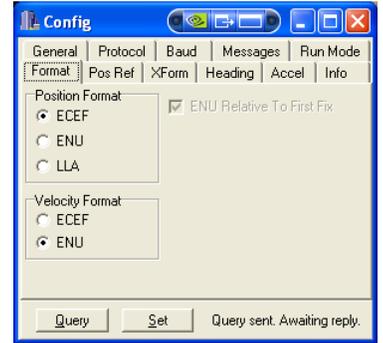
Figure 24. Pos Ref Tab

6.8 **Pos Ref -** The "Pos Ref" tab is used to set a location other than the *first fix* is needed to calculate a "Home" location for the unit (Figure 24). This tab may be manually populated or allowed to be populated by the GPS unit.
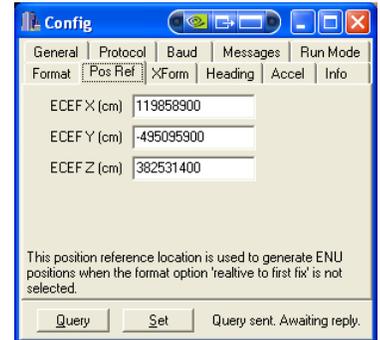
6.9 **XForm -** The "XForm" tab (short for "Transform") is used to change the virtual position of the unit (Figure 25). When a MIDG Series INS/GPS is mounted in an application; perfect alignment is often not possible. The "XForm" tab aligns the unit's output from its own sensor coordinates into the coordinate frame of the host vehicle. The angles are yaw-pitch-roll Euler combination. These angles are required to rotate the MIDG Series INS/GPS frame to be coincident with the application.

NOTE: Refer to the instruction titled "Setting Artificial Horizon" for detailed instructions on accomplishing this transform.

WARNING*************************************

Refer to the MIDG Series INS/GPS Users Manual for more information on how to properly mount the unit. Failure to properly mount the MIDG Series INS/GPS unit may result in undesirable operations and/or may damage the unit <u>THIS IS NOT COVERED BY WARRANTY.</u>

WARNING*************************************
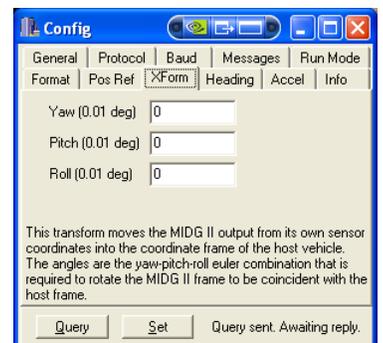
Figure 25. XForm tab

6.10 **Heading -** The "Heading" tab is used to adjust the magnetic declination offsets of the internal magnetometer which reflect the current direction of magnetic north when the unit is in the presence of magnetic interference (Figure 26). Under normal operating conditions, magnetic declination is calculated and applied via self-contained tables (International Geomagnetic World Model) based on the current Latitude and Longitude determined by the GPS receiver.

Figure 26. Heading Tab

    A. **Bias Values -** The bias values adjusts the units magnetic declination and magnetic dip.

    B. **Enable in INS mode -** This checkbox is used to enable or disable the magnetometers in INS mode.

    C. **Enable in VG mode -** This checkbox is used to enable or disable the magnetometers in VG mode.

    D. **Use Velocity vector for Heading Measurements -** This checkbox is used to enable or disable the use of velocity vectors for heading measurements.

        i. **Even When Turning -** Maintains use of the velocity vectors for heading while the unit is turning.

    E. **Aid Threshold -** This sets the magnetometer aiding level. These levels are detailed fully in application note "AN001 Operational Modes."
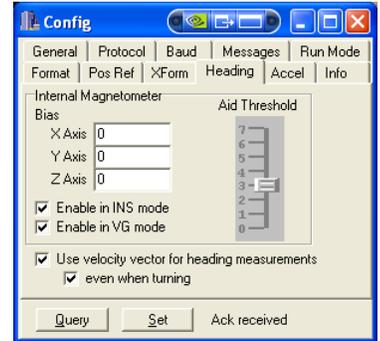
Note: Magnetic Declination Calibration should performed if the MIDG Series INS/GPS is in the presence of magnetic interference. Please refer to the instruction titled "MIDG Series INS/GPS Magnetic Declination Calibration Instructions" for detailed instruction on how to perform this procedure.

Note: Disabling the magnetometer provides NO INTERNAL HEADING REFERENCE. If the magnetometers are disabled there is no device to bound heading when the MIDG Series INS/GPS is static.

6.11 **Accel -** The "Accel" tab is used to compensate for accelerometer biases (Figure 27). The accelerometer biases compensation aids the unit by removing any biases which may be present. These biases are native to the sensors themselves and should be compensated for to ensure a more precise solution.

Figure 27. Info Tab

Note: Bias values should range from -30 to +30. If calculated bias values are beyond this range, the unit is out of calibration and will need to be returned for a full recalibration.

Note: These values will be stored as part of the MIDG Series INS/GPS configuration profile. Anytime the unit's configuration profile is erased, these values will be reset to zero.

Note: Refer to "Accelerometer Bias Compensation" for complete instruction on how to properly use this feature.

    A. **Accelerometer Bias Compensation Formula.** Figure 28 displays a generic formula for calculating accelerometer bias compensation. The formula example is to calculate the "y" accelerometer bias; however it is the same formula for all three axis.
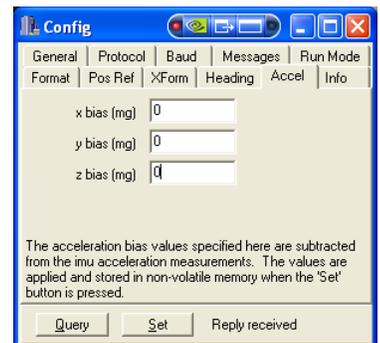
$$Accel\ Bias(y) = \frac{-ay + ay}{2}$$

Figure 28. Accelerometer Bias Formula

6.12 **Info -** The "Info" tab contains the indentifying information specific to the MIDG Series INS/GPS. This tab contains several pieces of information and may be queried at any time. The information displayed is: the manufacturer; product name; product part number; product serial number; the stock keeping unit number (SKU); and the firmware version (Figure 29).

Figure 29. Info Tab

7 Plotter. The "Plotter" is a sub utility found under the "Options" drop-down menu of the MIDG Display Utility. The "Plotter" displays the real time outputs of the sensors from the unit. The Plotter can also display the navigational rates and navigational accelerations as determined by the Kalman filter (Figure 30). All of the information displayed in the Plotter follows the same color assignment per axis, regardless of which sensor information is selected for display.

A. **Red -** "x" axis,

B **Green -** "y" axis

C. **Blue -** "z" axis.
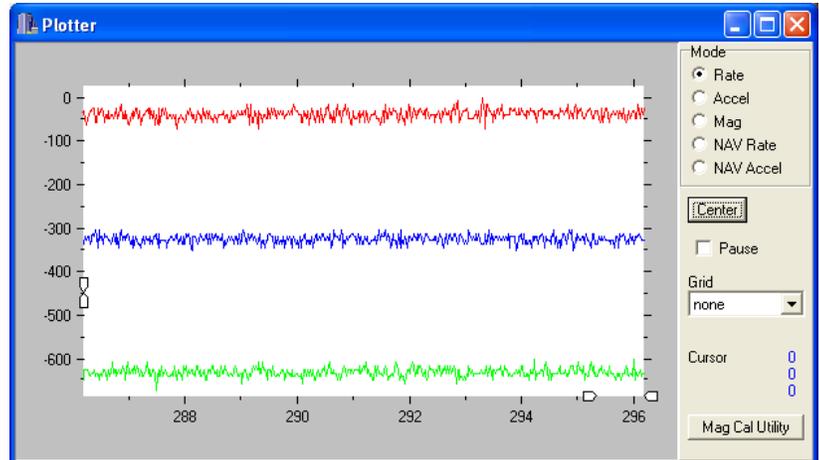
Figure 30. Plotter Utility

Note: When using this utility, if all three axis are not displayed, press the center button. This will center the display to display all three axis.

7.1 Plotter Sections. The "Plotter" utility is comprised of several different functions which are useful to the user. Each of these functions are detailed below.

7.2 Mode - The "Mode" section of the "Plotter" utility contains five (5) radio button which allow the user to visually compare all three axis of any given sensor.

A. **Rate -** This radio button allows the user to view the calibrated rate sensor outputs (p, q, r) in real time.

B. **Accel -** This radio button allows the user to view the calibrated accelerometer sensor outputs (ax, ay, az) in real time.

C. **Mag -** This radio button allows the user to view the calibrated magnetometer sensor outputs (mx, my, mz) in real time.

D. **NAV Rate -** This radio button allows the user to view the navigation rate sensor outputs post Kalman filtering.

E. **NAV Accel -** This radio button allows the user to view the navigation accelerometer sensor outputs post Kalman filtering.

7.3 Center - The "Center" button re-centers the display so that all axis for any given sensor system can be displayed simultaneously.

7.4 Pause - The "Pause" checkbox allows the user to pause the real time display. Pausing the real time display will not save any data. When resuming the real time output the Plot utility will start displaying the current sensor data.

7.5 Grid - The "Grid" drop-down list box allows the user to superimpose grid lines over the real time sensor outputs. The user can choose the following: none; horizontal; vertical; or both.

7.6 Mag Cal Utility - This "Mag Cal Utility" button is used only when performing a magnetic declination calibration. Please refer to the instruction titled "MIDG Series INS/GPS Magnetic Declination Calibration Instructions" for more information.

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8 Recording Data. On the Nav/GPS screen, located under the menu bar is the "Record" button. The "Record" button allows the user the ability to record data for later analysis. The following will instruct on how to record the data output from the MIDG Series INS/GPS (Figure 31).

Note: When recording data, no file extension is required. Prior to any recording, verify that all desired messages and message rates are set.

1. **Connect the MIDG Series INS/GPS.** Refer to the MIDG Series INS/GPS User Manual for proper interfacing instructions.

2. **Start an instance of MIDG Display Utility.**

3. **Select "Options" drop-down menu and select the "MIDG Config" option** to open the "Config" dialog box.

4. **Select the "Messages" tab and set all desired messages and message rates**

    Note: Be sure to "Set" the messages and "Save" the configuration in the "General" tab.

5. **Press the "Record" button.** This will open the "Save" dialog box.

6. **Designate the location and name of the data file to be saved.**

7. **Press the "Save" button.** This will close the "Save" dialog box and will start the recording of data.

Figure 31. Nav/GPS screen

When finished recording, Press the *"Stop"* button a dialog box will appear verifying that the user is ending the recording and Press the "Ok" button and the recording is finished. Refer to the instruction titled "Parser Instructions" for information on parsing and editing the data.

9 Help and Support. Microbotics, Inc. is dedicated to supporting the missions of our clients and offers free thirty (30) days of support for all of our products. The MIDG Display Utility, in the "Help" drop-down menu, contains the contact information for Microbotics, Inc.

1. **Start an instance of the MIDG Display Utility.**

2. **Select the "Help" drop-down menu.**

3. **Select "About" option.** The "About MIDG II Display" dialog box will appear.
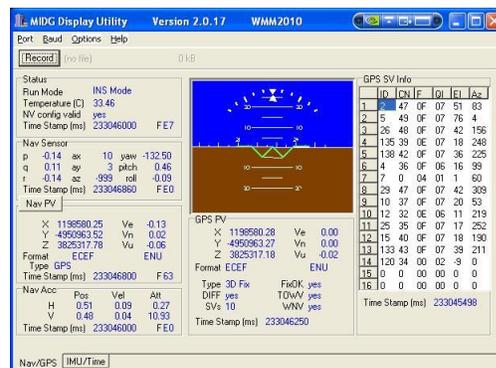
Figure 32. MIDG Display Utility Information.

Contact Microbotics, Inc. for pricing and availability. Specific technical questions should be sent to support@microboticsinc.com

ATTACHMENT A

Default Settings for the MIDG Series INS/GPS. The following table are all of the default settings for the MIDG Series INS/GPS. Detailed information on all messages is available in the current MIDG Message Specification.

Default settings for the MIDG Series INS/GPS				
TAB	**Setting**	**Message**	**Divisor**	**Frequency (Hz)**
General	N/A	N/A	N/A	N/A
Protocol	Microbotics Binary	N/A	N/A	N/A
Baud	115200	N/A	N/A	N/A
Messages	Enabled	STATUS	50	1.00
	Disabled	IMU_DATA	0	0
	Disabled	IMU_MAG	0	0
	Enabled	NAV_SENSOR	1	50
	Enabled	NAV_PV	5	10
	Disabled	NAV_HEADING	0	0
	Enabled	NAV_ACC	50	1
	Enabled	GPS_PV	12	4.17
	Enabled	GPS_SVI	50	1
	Disabled	GPS_RAW	0	0
	Disabled	GPS_CLK	0	0
	Disabled	TIM_UTC	0	0
	Not Supported	TIM_ERR	N/A	N/A
	Not Supported	TIM_PPS	N/A	N/A
Run Mode	INS	N/A	N/A	N/A
Info	N/A	N/A	N/A	N/A
Heading	X=0. Y=0. Z=0 / Enabled in INS Mode		N/A	N/A
XForm	Yaw=0. Pitch=0, Roll=0		N/A	N/A
Pos Ref	Relative to first fix -location dependant		N/A	N/A
Format	Position Format	Velocity Format	N/A	N/A
	ECEF	ENU	N/A	N/A

Erasing the MIDG Series INS/GPS configuration will default all values to the default settings. It is advisable to maintain a copy of all application settings prior to erasing the configuration.

The MIDG Series INS/GPS can only store one (1) configuration profile at a time.